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Abstract

ADVANCES IN RADIOACTIVE WASTE MANAGEMENT TECHNOLOGY - ITS EFFECT ON THE FUTURE NUCLEAR POWER INDUSTRY

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As the nuclear energy industry continues to grow, the problems of radioactive waste management can be broadly characterized as 1) the disposal or concentration of large volume, low-activity waste, and 2) the long-term or permanent storage or disposal of concentrated, high-level waste. Controlled environmental discharges of low-activity wastes have become more limited, primarily because of an expanding industry, but also due to the adoption of more stringent radiation protection guides.

These considerations have served as a basis for the U.S. waste management research and development program to develop improved and more efficient methods for the treatment and concentration of large volume, low-activity waste and for the ultimate disposal of these waste concentrates. New developments in synthetic ion-exchange, foam separation, and hydrofracturing, are discussed as potential future methods for the handling of low and intermediate level waste.

The inherent restrictions of tank storage for high activity waste, such as potential leakage and necessity of liquid-waste transfer for periods of hundreds of years, has resulted in an extensive "conversion-to-solids" research and development effort in the U.S. Pilot plant results on various calcination and fixation techniques, such as fluidized beds, heated pots, and radiant heated spray columns, are discussed. The addition of glass-forming materials to high activity waste for the purpose of providing a more stable final product is also being investigated. The proposed long-range waste management program at the Hanford production facility, with its particular site requirements, is briefly described. The effects of fission product removal for beneficial use is discussed as it relates to long-term waste management operations.

The investigation of specific geologic formations, such as salt structures and impermeable crystalline rock for ultimate storage or disposal of calcined solids

or certain types of liquid waste, is described. Plans for a proposed field experiment in salt with full-scale radioactivity are discussed.

Engineering evaluation studies, in connection with waste management operations in a future nuclear power economy, are summarized. The hazards and economics of various methods for handling, storage and/or ultimate disposal of high and low level liquid and solid wastes are being investigated. High level waste treatment and permanent storage costs for the nuclear power future have been estimated at approximately one percent of the total fuel cycle cost and less than one percent of the cost of nuclear power in a 4 mill/Kwh economy. Based on a continued successful field demonstration and testing program with high-activity waste, it is firmly believed that waste management operations will not provide any deterrent to the development and growth of the nuclear power industry.